Vaccines and choice of the vaccines to support FMD prevention and control program

Presented by Dr. Dmitry Mikhalishin

FMD International Statuses of ARRIAH

- OIE Regional Reference Laboratory for FMD for Eastern Europe, Central Asia and Transcaucasia (1995)
- OIE Collaborating Centre for Diagnosis and Control of Animal Diseases for Eastern Europe, Central Asia and Transcaucasia (1997)
- FAO Medal for FMD Control (2004)
- FAO Reference Centre for FMD (2013)

World Organisation for Animal Health

FGBI ARRIAH
Federal Centre for Animal Health

- More than 120 DSc and PhD holders are employed by ARRIAH, more than 40 post-graduates are working on their PhD thesis under the guidance of our team Doctors of Sciences.
- ARRIAH produces more than 140 different veterinary products including 70 vaccines, 57 diagnostic kits protected by 48 valid patents.
- Has the greatest diagnostic capacities to perform tests for many infectious animal diseases
- Ability to control produced vaccines from the development stage to practical application
- Scientific support of products and permanent consulting on farms

Principal approach to FMD vaccine production.

- Permanent monitoring of immunobiological properties of FMDV isolates;
- Matching of FMD virus isolates with vaccine strains;
- Preparation of new production FMDV strains;
- Determination of current importance of FMDV strains in the regions


FMD epidemic situation in Pakistan
(OIE, 2018 - 2021)
23.07.2021
DUSHANBE
Tajikistan
Uzbekistan
Turkmenistan
China
Gilgit-Baltistan
Khyber Pakhtunkhwa
AJK
KABUL
ISLAMABAD
Islamabad
Afghanistan
FATA
Punjab
Baluchistan
Iran
Pakistan
India
Sindh
N
0 65 130 260 KM
Legend:
- FMD-infected area
- major road
- main city
Серотип вируса:
- FMD type O
- FMD type A
- FMD type Asia1
Location
2018 (serotype -the number of outbreak)
2019 (serotype -the number of outbreak)
2020 (serotype -the number of outbreak)
2021 (serotype -the number of outbreak)
Baluchistan
Asia 1, O - 56
A, O - 37
Khyber Pakhtoon Khowa
O - 2
A, Asia 1, O - 172
A, Asia 1, O - 116
according to the media
Punjab
A, Asia 1, O - 331
A, Asia 1, O - 1016
A, Asia 1, O - 131
Sindh
A, Asia 1, O - 71
A, Asia 1, O - 622
A, Asia 1, O - 384
Islamabad Capital Territory
Asia 1 - 8
Total
384
1874
668

Selection of currently important vaccine strains for Pakistan

Virus samples	Vaccine strains
A/ASIA/Iran-05 (SIS-13) A/ASIA/Iran-05 (FAR-11)	A/ASIA/Iran-05
O/ME-SA/PanAsia-2 (ANT-10) O/ME-SA/Ind-2001 (e)	O/ME-SA/PanAsia-2
ASIA-1/ASIA/Sindh-08	ASIA-1/ASIA/Sindh-08

Scientific support for FMD vaccines.

- Consultative and information support on FMD immunoprophylaxis.
- Consultative and information support in serological testing.
- Studies of immunobiological properties of viruses (studies of antigenic relatedness between epidemic isolates and vaccine strains).

MEANS OF IMMUNOPROPHYLAXIS
FMD vaccines developed and produced by FGBI “ARRIAH”

- Vaccines undergo quality control in compliance with recommendations of the OIE *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals.*
- Immunogenicity of all vaccines is not less than 6 PD_{50} per dose.
- FMD vaccines do not induce antibodies to FMDV non-structural proteins - NSP free.

FGBI “ARRIAH” is major FMD vaccine developer and producer

FGBI “ARRIAH” vaccines:

1. **Adsorbed (aluminum hydroxide-saponin adjuvanted) vaccine to immunize cattle, yaks, buffaloes, camels, sheep and goats** (Immunity is induced 21 days post vaccination and lasts for at least 6 months, at least 6 PD_{50}/dose)
2. **Emulsion vaccine to immunize all susceptible animals** (Immunity is induced 21 days post vaccination and lasts for at least 6 months, at least 6 PD_{50}/dose)
3. **Universal concentrated vaccine to immunize all susceptible animals** (Immunity is induced 7 days post vaccination and lasts for at least 6 months, at least 20 PD_{50}/dose)

Vaccination schedule

Adsorbed (aluminum hydroxide-saponin adjuvanted) vaccine for immunization of cattle, yaks, buffaloes, camels, sheep and goats

Immunity is induced 21 days post vaccination

Administration route – subcutaneously

	Cattle, small ruminants (young animals under 18 months old)	Cattle, small ruminants (adult animals of 18 or more months old)
Zone where vaccination is practised	Vaccinated starting from the age of 3-4 months Revaccinated every 3 months until 18 months old	Revaccinated every 6 months
Risk zone	When the risk zone is established, all clinically healthy animals are vaccinated irrespective of the time of the previous vaccination. Animals are vaccinated twice at intervals of 10-20 days. Then animals are revaccinated every 3 months until they are 18 months old.	When the risk zone is established, all clinically healthy animals are vaccinated irrespective of the time of the previous vaccination. Animals are vaccinated twice at intervals of 10-20 days and revaccinated every 6 months.

Key Characteristics of Adsorbed and Emulsion Vaccines







- Adsorbed Vaccine:

- induces early immunity in vaccinated animals

- is cheaper

- Emulsion Vaccines:

- emulsion is administered intramuscularly and this simplifies the vaccination process

- develops a longer and stronger immunity in vaccinated animals

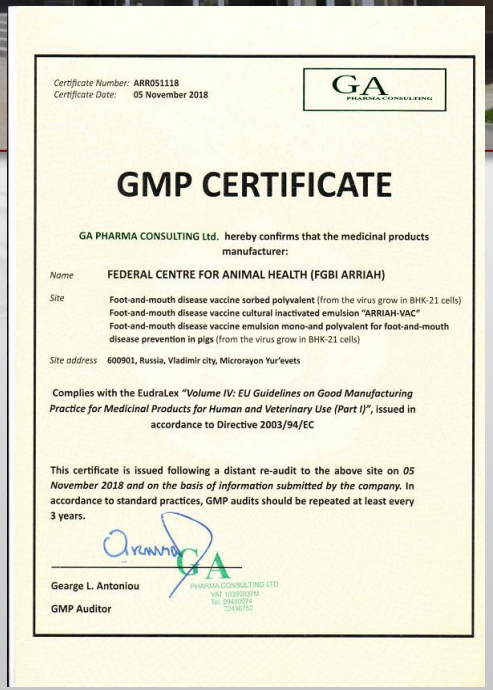
- all susceptible animals can be vaccinated with revaccination in 6 months

- young cattle and small ruminants are vaccinated starting at the age of 4 months and 1.5 months, respectively, with subsequent revaccination every 6 months

Production

Production facilities comply with GMP and GLP standards as confirmed by Russian and international certificates

ISO 9001-2015
Quality Standard



Certificate Number: ARR051118
Certificate Date: 05 November 2018

GA PHARMA CONSULTING

GMP CERTIFICATE

GA PHARMA CONSULTING Ltd. hereby confirms that the medicinal products manufacturer:

Name: FEDERAL CENTRE FOR ANIMAL HEALTH (FGBI ARRIAH)

Site: Foot-and-mouth disease vaccine sorbed polyvalent (from the virus grow in BHK-21 cells)
Foot-and-mouth disease vaccine cultural inactivated emulsion "ARRIAH-VAC"
Foot-and-mouth disease vaccine emulsion mono-and polyvalent for foot-and-mouth disease prevention in pigs (from the virus grow in BHK-21 cells)

Site address: 600901, Russia, Vladimir city, Microrayon Yur'evets

Complies with the EudraLex *"Volume IV: EU Guidelines on Good Manufacturing Practice for Medicinal Products for Human and Veterinary Use (Part I)"*, issued in accordance to Directive 2003/94/EC

This certificate is issued following a distant re-audit to the above site on *05 November 2018 and on the basis of information submitted by the company.* In accordance to standard practices, GMP audits should be repeated at least every 3 years.

Gearge L. Antoniou
GMP Auditor

GMP Certificate

FMD Vaccine Quality Control

Quality criteria:

- ✓ Appearance
- ✓ Determination of hydrogen ion concentration (pH)
- ✓ Sterility test
- ✓ Innocuity test (Inactivation)
- ✓ Safety
- ✓ Potency
- ✓ Purity test (for antibodies to non-structural proteins)

Vaccine challenge studies in susceptible animals, animal facilities

Tests for innocuity

The vaccine is administered to each of 2 animals at a dose of 2 ml per animal by injection in 20 sites of tongue mucosa, 0.1 ml per site.

The vaccine is considered innocuous when all animals inoculated with the vaccine remain clinically healthy within 14 days and no FMD characteristic lesions are detected at autopsy.

Tests for safety

The vaccine is administered subcutaneously to 2 cattle in the upper third of the neck at a dose of 6 cm^3.

The vaccine is considered safe when all the animals remain clinically healthy during the observation period (except for general and local reaction to adjuvant) and no tissue necrosis at the vaccine inoculation site is detected.

Tests for purity
(detection of FMDV NSP antibodies)

One vaccine dose is administered subcutaneously 14 days after tests for innocuity and safety. Blood samples are taken 14 days post the last vaccination. Blood sera are tested for antibodies to FMDV non-structural proteins. Vaccine should not induce antibodies to FMDV non-structural proteins.

Vaccine immunogenicity tests

non-diluted vaccine

1:4 diluted vaccine

1:16 diluted vaccine

controls

All animals should be challenged 21 days post vaccination

Use of FMD Vaccines in Mongolia

- In 2011-2012, 36.8 million doses of bivalent type A, O FMD vaccine and 120 thousand doses of monovalent type O FMD vaccine were supplied to the Republic of Mongolia. Monitoring was conducted before and after vaccination with the vaccine.
- 1,407 blood samples were taken from animals in 7 aimags (provinces) of the central and eastern parts before vaccination to assess the immunity level.
- The number of immune animals was 0 – 20.7%.
- The use of adsorbed bivalent FMD vaccine induced high level of FMD antibodies against type O and A FMDV in all sums (districts) of controlled aimags.
- As a result, FMD was eradicated in Mongolia in 2011-2012.

Official recognition of the FMD free status of Kazakhstan by the OIE as a result of vaccination with ARRIAH FMD vaccines

Official FMD status in Kazakhstan

The FMD free zones (with and without vaccination) are covering the whole country of Kazakhstan

FMD free zones where vaccination is not practised (August 2014 and August 2018)

- Zone I consisting of West Kazakhstan, Atyrau, Mangystau and south-western part of Aktobe region
- Zone II including north-eastern part of Aktobe region, southern part of Kostanay region and western part of Karaganda region
- Zone III including northern and central parts of Kostanay region, western parts of North Kazakhstan and Akmola regions
- Zone IV including central and eastern parts of North Kazakhstan region and northern parts of Akmola and Pavlodar regions
- Zone V including central and eastern parts of Karaganda region and southern parts of Akmola and Pavlodar regions

FMD free zones where vaccination is practised (August 2016)

- Zone I covering Almaty
- Zone II covering East Kazakhstan
- Zone III including part of Kyzylorda, the northern part of South Kazakhstan and northern and central parts of Zhambyl
- Zone IV including the southern part of Kyzylorda and the south-western part of South Kazakhstan
- Zone V including the south-eastern part of South Kazakhstan and the southern part of Zhambyl

Region Framed Regions are part of different FMD free zones

* Dates shown in brackets indicate when the relevant applications were submitted to the OIE by the Delegate.

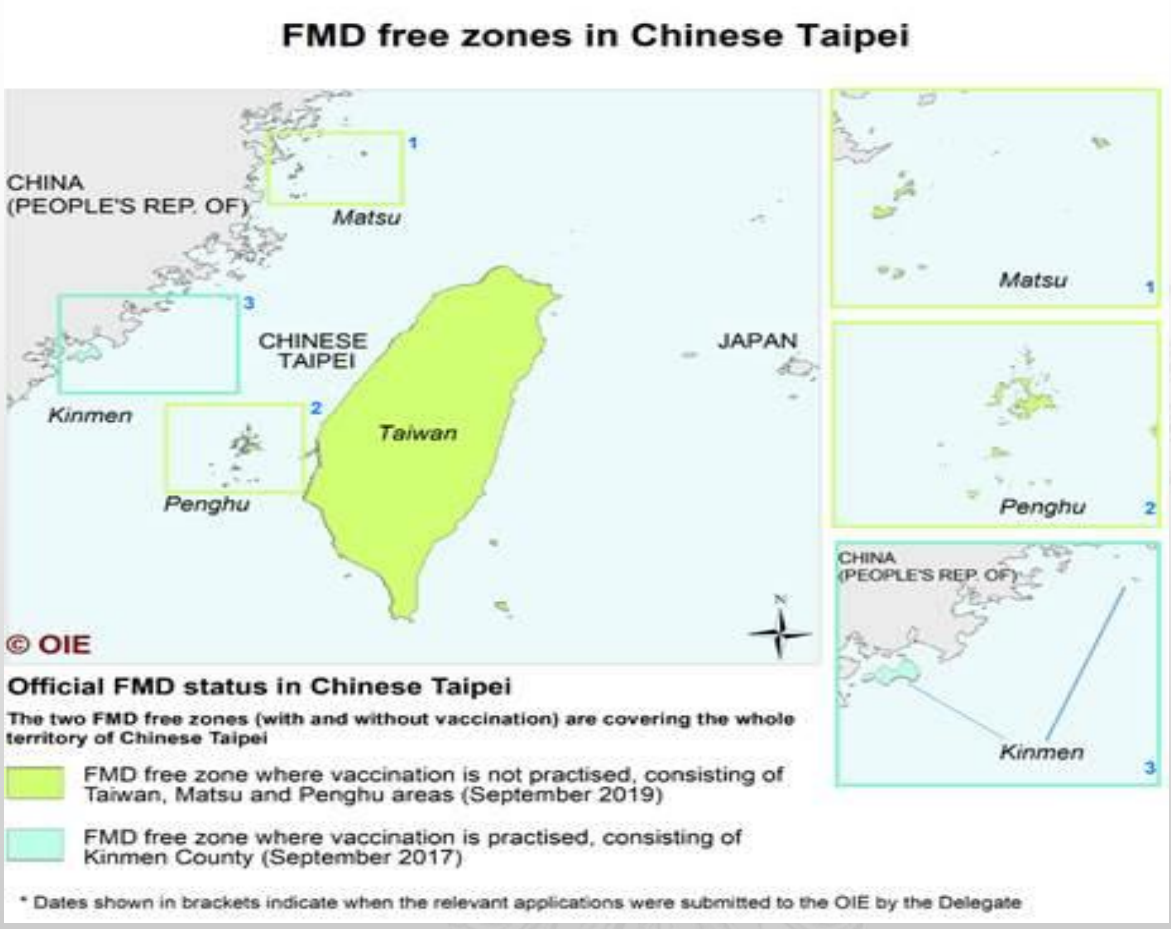
- **The last FMD outbreaks were reported in Kazakhstan:**
- **in the *zone without vaccination* in 2011,**
- **in the *zone with vaccination* in 2013.**

- **In 2014, 2018, the status of Kazakhstan as an "FMD free zone without vaccination"**

- **In 2016, the OIE officially recognized the status of 5 FMD free zones with vaccination.**

- **Supplies of ARRIAH 5-strain adsorbed vaccine to Kazakhstan started in 2012 allowed to prevent FMD outside the *protection zone with vaccination* and allowed Kazakhstan to gain the OIE official FMD free status for the regions where vaccination is practised.**

Official recognition of the FMD free zones in Taiwan as a result of vaccination with ARRIAH FMD



- **The last 2 FMD outbreaks were registered in Taiwan in 2015.**
- **The use of ARRIAH *monovalent emulsion* FMD vaccine since 2009 allowed to eradicate FMD in the territory of Taiwan.**

Awards received by the FGBI ARRIAH at Russian and International exhibitions for FMD vaccines developed in the FGBI ARRIAH

FGBI “ARRIAH”

Thank you for attention!